



## Case control study of ABO blood group and Rhesus (Rh) factor in type 2 Diabetes Mellitus

## KEYWORDS

Blood group, Rhesus factor, Diabetes mellitus(DM)

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## ABSTRACT

*Our aim was to determine the association of diabetes mellitus with ABO and Rhesus(Rh) blood groups. 100 blood samples were taken(50 healthy controls and 50 diabetic patients) and analysed for blood sugar(GODPOD method) and blood group(using standard antisera). Patients having fasting blood sugar>126mg/dl were considered diabetic. Statistical analysis was done using chi-square test. Frequency of blood group B was high in both patients(46%) and controls(44%). The order of distribution in both groups were similar(i.e B>O>A>AB). Blood groups A(16%) and O(36%) were more common in control groups whereas AB(8%) in diabetics. Rh positive blood group was more frequent in diabetics than compared to controls. No association of blood group and Rh factor with diabetes mellitus was observed( $p>0.05$ ). Similarly genderwise association also could not be developed( $p>0.05$ ). No association existed between blood group and diabetes mellitus. Extensive study is needed to establish the correlation.*

## Introduction

Karl Landsteiner first described the ABO blood group in 1900<sup>[1]</sup>. Blood grouping is based on antigenic property of red blood cells (RBC). The major human blood group system is ABO. The blood group of a person depends upon the presence or absence of two genes A and B. The majority of ABO determinants are expressed on the ends of long polylactosamine chains<sup>[2]</sup>. The gene for ABO group is present on chromosome 9 and on chromosome 1 for Rh system. According to the presence or absence of Rh antigens, blood group is classified into Rh positive or negative<sup>[3]</sup>. The ABO system consists of complex carbohydrate molecules. The A and B Glycosyltransferase encoded by A and B alleles converts H antigen into A and B determinants. This enzyme is deficient in the group O individuals who continue to express H antigen<sup>[4]</sup>. Ever since the discovery of blood groups in 1900, there have been efforts to discover a possible association between ABO and Rh blood groups and different diseases<sup>[5]</sup>. Certain diseases show strong association with the ABO blood groups, notably, peptic ulcer is much higher in blood group O<sup>[6]</sup> whereas stomach cancer<sup>[7]</sup>, tumors of salivary glands<sup>[8]</sup> are more frequent in blood group A individuals. Many reports have appeared in recent years suggesting an association between blood groups and diabetes mellitus<sup>[9]</sup>.

Diabetes mellitus is a multifactorial trait. The etiology of diabetes mellitus is complex and appears to involve interactions of genetic, immunological and environmental<sup>[10]</sup>. Infact, human chromosome 1q21-q23 showed well replicated linkage to type-2 diabetes mellitus<sup>[11]</sup>. The ABO blood group genes are mapped at 9q34.2 region in which genetic alteration is common<sup>[12]</sup>. Identification of a positive association with blood groups might reflect increased susceptibility to and a negative association protection against diabetes mellitus<sup>[5]</sup>. McConnell's in 1955 suggested an increased frequency of blood group A among diabetic patients<sup>[13]</sup>. In Copenhagen, significant excess of blood group O was found in male diabetics<sup>[14]</sup>. In Italy<sup>[15]</sup> and Trinidad<sup>[16]</sup> results showed an increased frequency of blood group B among diabetics, but in Germany<sup>[17]</sup>, Glasgow<sup>[18]</sup>, Bangladesh<sup>[19]</sup> and a number of other recent studies, no association was apparent between type 2 diabetes mellitus and blood group in the diabetics studied<sup>[20]</sup>. Since the results have been variable, inconsistent and differ-

ent from one region to other, an attempt has been made to investigate any association with the ABO blood types and diabetes mellitus in this study.

## Materials and methods

The study consisted of 100 individuals (50 diabetic patients and 50 healthy controls). The study was conducted in Goldfield institute of medical sciences and research, Chhainsa. Blood sugar was determined by GODPOD method. Patients having fasting sugar more than 126 mg/dl was taken to be diabetic. Blood group was determined by using standard antisera. Blood sample was mixed with anti A serum, Anti B serum and Anti D serum. Agglutination was confirmed by observing under low power objective of compound microscope. Statistical analysis was done by chi square test to estimate the probability of difference in distributions occurring by chance. The value of  $p<0.05$  indicated statistically significant difference.

## Results

The distribution of ABO blood group among type 2 diabetic patients and control is shown in table 1. Blood group B was more common in both diabetic patients (46%) and controls (44%). Blood group A (16%) and O (36%) were more common in controls whereas blood group AB (8%) was more frequent in diabetics. But the difference of distribution was not statistically significant ( $\chi^2=$ ,  $p>0.05$ ). More number of diabetics (90%) was Rh positive as compared to controls (88%) but we could find the significant difference ( $\chi^2=$ ,  $p>0.05$ ).

When genderwise distribution of blood group was compared, we found the dominant blood groups to be blood groups A (12.5%), AB (8.33%) and O (41.67%) in diabetic males. Blood group O was the most dominant one. In case of diabetic females, blood group B (53.8%) was predominant. In non diabetic subjects, dominant blood groups were A, B and AB in males, most common being B (50%) blood group. Blood group O (39.5%) was predominant in females (table 3) but statistical significance could not be obtained ( $p>0.05$ ,  $\chi^2=1.41$  for control group and 1.54 for diabetic group). Similarly we could not find significant association between gender and Rh factor ( $p>0.05$ ,  $\chi^2=0.78$  and 0.14 for controls and diabetics respectively).

**Table 1. Distribution of blood group in type 2 diabetic patients and controls**

Blood group	Diabetics % (n)	Controls % (n)	$\chi^2$ (p value)
A	12%(6)	16%(8)	0.98 (0.8)
B	46%(23)	44%(22)	
O	34%(17)	36%(18)	
AB	8%(4)	4%(2)	
	100%(50)	100%(50)	

**Table 2. Distribution of Rh factor in type 2 diabetic patients and controls**

Rh factor	Diabetics % (n)	Controls % (n)	$\chi^2$ (p value)
Positive	90%(45)	88%(44)	0.102
Negative	10%(5)	12%(6)	(p=0.74)

**Table 3. Genderwise association of blood group in type 2 diabetic patients and controls**

Blood group	Non diabetic		Diabetic	
	Male % (n)	Female % (n)	Male % (n)	Female % (n)
A	16.67%(2)	15.8%(6)	12.5%(3)	11.5%(3)
B	50%(6)	42.1%(16)	37.5%(9)	53.8%(14)
O	25%(3)	39.5%(15)	41.67%(10)	27%(7)
AB	8.33%(1)	2.6%(1)	8.33%(2)	7.7%(2)
	100%(12)	100%(38)	100%(24)	100%(26)
$\chi^2$ (p value)	1.41(0.7)		1.54 (0.67)	

**Table 4. Genderwise association of Rh factor in type 2 diabetic patients and controls**

Rh factor	Non diabetic		Diabetic	
	Male%(n)	Female%(n)	Male%(n)	Female%(n)
Positive	83.3%(10)	92.1%(35)	91.7%(22)	88.5%(23)
Negative	16.7%(2)	7.9%(3)	8.3%(2)	11.5%(3)
$\chi^2$ (p value)	0.78 (0.37)		0.14 (0.7)	

## Discussion

Blood group distribution in different population groups is an important consideration in health care. Several reports have evaluated the possible relationship between diabetes mellitus and Rh blood group; however, the populations vary and the findings are inconsistent. Our study demonstrated no association between the ABO blood group and DM. Our results are in agreement with those of many other studies. In a study which included 511 patients with type 2 DM and 454 healthy control subjects, it was concluded that there was no association between ABO blood groups and type 2 DM<sup>[21]</sup>. Similarly Zeytinoglu I and Maher showed no significant difference between controls and patients with diabetes mellitus<sup>[19]</sup>. Dr Berg K et al<sup>[22]</sup> and Sharma S et al<sup>[9]</sup> also could not find the association between DM and the ABO system. However, an association of DM with the ABO blood groups was

demonstrated in several studies<sup>[15,16,17,18]</sup>. Jolly JG and Sarup BM et al found significant preponderance of group O among diabetic patients<sup>[23]</sup>. W.E. Jassim found significantly higher occurrence of blood group O than other groups in male and female patients in Baghdad<sup>[24]</sup>.

We found higher frequency of blood group B in both diabetics and control groups (46% and 44% respectively). Our finding was similar to Sharma S et al<sup>[9]</sup>, Henry and Poonking et al<sup>[18]</sup> and Egawa et al<sup>[25]</sup> who found increased frequency B blood group in diabetics but in the study of Waseem AG et al blood group AB was more common in diabetics as compared to controls<sup>[5]</sup>. For O blood group, diabetics were more numerous than non diabetics in our study but the difference did not reach statistical significance (>0.05)<sup>[20]</sup>. In 1964, Macafee<sup>[26]</sup> tried to find the association between diabetes mellitus and blood group. He observed similar distribution of different blood groups in both control and patients. Koley<sup>[21]</sup>, Sidhu et al<sup>[27]</sup>, Qureshi and Bhat<sup>[3]</sup> also made the similar observation.

We observed higher frequency of Rh negative blood groups in controls as compared to diabetics. It was in contrast to that of Waseem AG et al, who found increased frequency of Rh negative blood group in diabetics<sup>[5]</sup>. Sidhu et al in their study conducted in Punjab also found the similar results<sup>[27]</sup>. Similarly on comparison of genderwise association of Blood group and Rh factor between diabetes (male and female) and controls (male and female), significant association could not be obtained. According to Dali et al<sup>[20]</sup>, the Rh blood system may play some role in the process of glucose metabolism and may influence the clinical expression of diabetes mellitus. However their results suggest that there is no association between Rh blood groups and type 2 DM, which is in accordance with the results of previous studies<sup>[22]</sup>.

The possible explanation of these conflicting findings may be the racial and geographical factors that probably have a role in genetic expression of disease. The mechanism through which control of particular genes on blood glucose levels is poorly understood, therefore, future investigations are necessary to elucidate fully the genetic contributions to type 2 diabetes mellitus<sup>[22]</sup>.

## Conclusion

Our study did not show any significant association of blood group and Rh factor with type 2 DM. More extensive study including larger sample size is necessary to establish the correlation.

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